The status, population characteristics and harvest of the river otter in Maryland

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The status, population characteristics and harvest of the river otter in Maryland[1, 2]

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I. INTRODUCTION

The otter (*Lutra canadensis*) is a popular and valuable furbearer throughout most of the United States and Canada. In Maryland, it has been an important furbearer for over 150 years. The otter ranks tenth in terms of numbers of animals trapped in Maryland and sixth in terms of revenue received for legally harvested pelts. For example, the 1976–1977 harvest of otter in Maryland was 182 pelts worth $9,100. Despite the importance of the otter as a furbearer, very little biological information is available because of the mobility of otter and the resulting difficulty of field studies. A review of literature revealed only a few studies, mostly dealing with food habits or observational natural history (Erlinge 1968, Field 1970, Greer 1955, Grinnell et al. 1937, Hamilton 1961, Knudsen and Hale 1968, Lagler and Ostenson 1942, Morejohn 1969, Ryder 1955, Sheldon and Toll 1964, Toweill 1974, and Wilson 1954). In addition, little has been reported concerning the reproduction, home range, or census methods for the river otter.

Because of the recent public interest in the environment and endangered species, many animals are considered endangered until it is proven otherwise. This has resulted in continued pressure to discontinue harvest of otter in Maryland and other states. Coupled with incomplete knowledge of reproductive parameters, movement, density, or a valid census technique, these factors have hindered the development of sound management regulations regarding the otter.

In Maryland, current regulations and an interest on the part of trappers has resulted in a very favorable climate for obtaining carcasses of harvested otter. Therefore, we were able to obtain information which had not been readily available in the past.

It is hoped that this report will provide information which will insure that the otter continues to thrive for both consumptive and non-consumptive users.

This study would not have been possible without the aid and cooperation of several persons. Gale Willner and Richard Lattanzio prepared the histological sections and aided in many other ways. The Maryland Trappers Association and various trappers from throughout Maryland provided the carcasses from which our data was obtained. George Feldhamer, J. Edward Gates, and Walt Cottrell critically reviewed the manuscript and made many helpful suggestions. Mabel L. Lancaster, Kathryn A. Hoadley, and Wilma J. Grimm, AEL, assisted in the preparation of the manuscript. Frances Younger, Scientific Illustrator, CEES, prepared the figures.

II. MATERIALS AND METHODS

Between July 1974, and June 1977, 284 river otter carcasses were collected from trappers. Most were trapped on Maryland's eastern shore, but a few were obtained from other areas of Maryland and Virginia's lower shore. In addition, careful observation was made of field signs by project personnel, trappers and other interested persons in Maryland.

Field Observations

An important aspect of the management of any secretive, wide ranging mammal is the recognition of its signs. Many field naturalists are familiar with otter haul outs and tracks, however, there are a number of otter signs which have received little or no attention. Otter slides, which have been described most extensively, have been located only rarely in Maryland (Fig. 1). For this report, we have divided otter field signs into nine categories (Mowbray et al. 1976) as follows:

1. Haul outs—long established sites repeatedly used by otter for loafing and feeding. These sites have a worn trail from the water's edge and are usually scattered with fish scales, bones, and scats (same as "pulling out" places, wallows, latrines (Greer 1955), "trays" (Heinold 1950), and sprainting areas (Erlinge 1967)).
2. Bedding sites—concentric impressions on the ground left by sleeping otter. Like many other mammals, otters circle the bedding site several times before lying down. An edge of leaves and matted vegetation is apparent around otter beds.
3. Rolling sites—areas approximately 2 square meters dominated by *Spartina patens* and *Distichlis spicata* which were matted down by frolicking otter. The grass was often scratched up.
4. Scrapes—areas scraped bare by otter that were usually used more than once. Distinguished from haul outs by the absence of any food remains or scats.
5. Dens—holes in banks or under large objects, such as the base of trees, or duck blinds used by otter for rearing their young.
6. Tracks—distinct foot prints, readily identifiable as those of otter.
7. Single scats—scats not associated with haul outs or obvious feeding sites.
8. Diggings—areas dug up by otter in search of reptile eggs, crayfish and other food items usually in association with tracks or other sign readily distinguishable from raccoon (*Procyon lotor*) or opossum (*Didelphis virginiana*) activity.
9. Scent posts—a site 1–2 meters square with several digging and scratching sites located within. No food remains, scats, or beds were found within these sites, although other sign was found in the vicinity.

Harvest

When otter pelts were tagged by DNR personnel, information on location and date of capture was recorded on a standard form. In addition, whenever possible, the carcasses collected were examined and the method used to catch the otter recorded (i.e., leg trap, Conibear trap, shot).

Habitat

Field observations were made at locations of otter sign in Maryland. The characteristics of otter sign were noted as well as the type of habitat and frequency of occurrence of the various kinds of sign. In addition to locating otter sign, direct observations of otter were made and harvest records examined. Most otter were observed in open water or along the banks of streams and ponds where the otter could be seen for a considerable distance. Trappers and other persons who observed otter were also interviewed and the locations of their observations recorded. Observations of otter and their sign were used to determine the preferred habitats of otter in Maryland.

Figure 1. River otter slide at Deal Island Wildlife Management Area, Somerset County, Maryland (photo by Walt Cottrell).

Trappers are required by regulation to tag each of their otter pelts prior to its sale. Trappers obtaining otter tags were contacted and asked to keep records of the county and stream system in which their otter were taken. These data were used to estimate the distribution and relative abundance of otter in Maryland. It should be pointed out that there is inherent error in that these data also reflect the distribution of harvest effort.

Density

Estimates of the population density of otter within Maryland were obtained from existing Wildlife Administration records. Additional data were obtained through field studies conducted in cooperation with Maryland otter trappers to determine distribution of trapping efforts.

Home Range

We attempted live-trapping as a method of collecting data on otter home range. More than 500 trap nights of efforts were made throughout 1974 and 1975 using various live traps. Traps were checked daily for approximately two weeks and then moved to new locations. However, we were unsuccessful in live-trapping otter, and the method was considered to be too time consuming.

Otter were observed to travel more than a mile in a matter of minutes. Road-killed otter and otter trapped in raccoon sets far from water confirm the fact that otter move away from water.

Necropsy

Otter were necropsied as soon as possible after killed, although some were frozen for later necropsy. The sex of the otter collected from trappers was determined by examination of external genitalia (Godin 1977:236). Ovaries and reproductive tracts were preserved in Bouin's fluid. Organ weights were taken on a top-loading Mettler balance (Model P163).

Males

Testes were removed, separated from the epididymides, and weighed on a top-loading Mettler balance.

Females

Reproductive tracts were removed and examined for visible signs of pregnancy, embryo resorption and placental scars. Histological sections were made of the ovaries. Sections (10 μ thick) were stained with hematoxylin, and each was examined for ruptured follicles, regressing corpora lutea, active corpora lutea, and Graafian follicles.

Age Determination

Age determination was based on tooth cementum bands (Fig. 2). Many workers have used cementum bands and found it to be a reliable indicator of age (Tabor and Wight 1977, Stephenson 1977, Rudge 1976, Craighead et al. 1970). However, the details of the procedure for otter have not been precisely outlined and because of this, considerable difficulty may be encountered during the tooth sectioning process. We have outlined below the procedure we found best:

1. Remove a canine by boiling the skull or mandible until the tooth can be easily extracted.
2. Place tooth in a tissue capsule with a pencil-marked label; place in 10 percent non-buffered formalin for at least one hour.
3. Place tooth in a decalcifying solution ("Decal") or in 5 percent nitric acid (5 ml nitric acid, 95 ml distilled water) overnight or until pliable. Ten to 15 teeth per one-half gallon of solution is enough in a one-gallon jar.
4. Do not remove pulp—it makes sectioning easier, only the *root* portion of the tooth will be used. Cut tooth in half, longitudinally, and remove crown portion with a sharp scalpel blade. Tooth should be pliable and *very* easily cut.
5. Rinse tooth in running water for three hours.
6. Tooth can be stored in water for four to five days. If it is necessary to keep longer, store in 10 percent formalin, but be sure to rinse in water prior to sectioning.
7. Set the International Cryostat Model CTI at −20° C. Operating temperatures will vary between −30° and −10° C—the lower the temperature the better. Place five drops of distilled water on the tissue holder and freeze until crystals form. Place tooth on holder in horizontal position and cover with water. Quick freeze for three minutes.
8. Clean microscope slides with distilled water and dry. Place one small drop of fresh albumin on slide and smear. Label frosted end of slide.
9. Cut seven to nine sections per slide from center of tooth—12 microns thick; two slides per tooth.
10. Use a few drops of water on slide to flatten and straighten tooth. Do not flood. Blot excess water with filter paper.

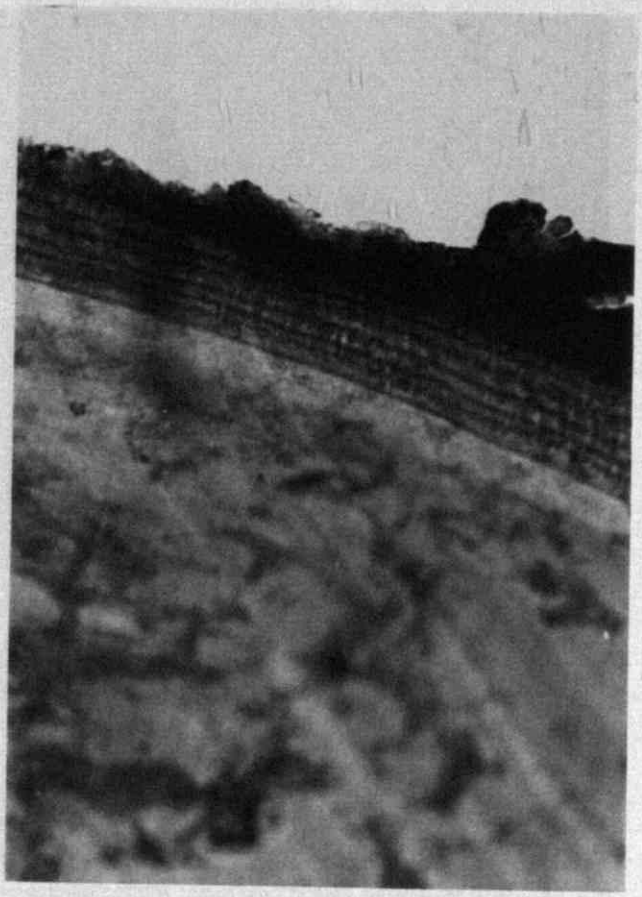

Figure 2. Micro-photograph of a section of a canine tooth from a river otter collected in Maryland estimated to be 6 years old.

III. HARVEST

Otter in Maryland were harvested primarily in counties bordering the Chesapeake Bay. Counties contributing to the otter harvest are ranked in Figure 3. Number of otter harvested from 1973 to 1978 and percent of total harvest, by county, are found in Table 1.

The only other major water system which appears to contribute to the otter harvest is the Potomac River. Seven otter are recorded for Frederick and Montgomery counties over the three-year period. These animals represented less than one percent of the recorded harvest.

Dorchester County contributed the highest number of otter in Maryland's harvest for the period considered (Table 1). This is expected to continue as long as that county possesses the greatest amount of bay shoreline, remote wetlands, and major river systems. It was interesting to note that while St. Mary's, Queen Anne's and Talbot counties yielded more otter than Dorchester County in some years, Dorchester's harvest increased, while the others' harvest decreased in successive years, probably because of changes in amounts of wetlands.

All otter recorded annually from pelt tag records were trapped between 1 January and 15 March, the legal trapping season. Overall, the harvest was evenly distributed between those dates. Sporadic periods of high catches were thought to be weather dependent.

Both the leg trap and the body-gripping trap have been used to take otter in Maryland (Table 2). The number 4 Victor-type and the 330 Conibear are the most commonly used sizes. Although otter are rarely reported as non-target species, increased trapping effort directed at nutria (*Myocastor coypus*) could result

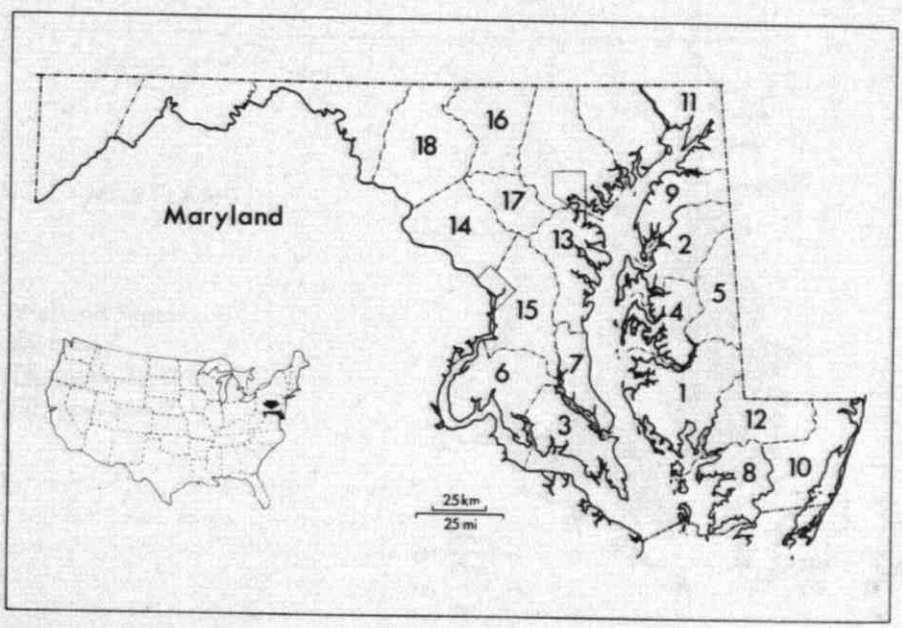

Figure 3. Distribution and numerical order of the river otter harvest in Maryland by county. Numbers refer to numerical order and county designations in Table 1.

Table 1
Number of otter harvested in Maryland by county (1973-1978).[1]

County	1973	1974	1975	1976	1978	Total	Percent
Dorchester	16	27	32	22	67	164	22.8
Queen Annes	15	27	14	26	15	97	13.6
St. Marys	20	12	25	4	17	78	10.8
Talbot	20	19	13	10	13	75	10.4
Caroline	14	19	10	7	24	74	10.3
Charles	12	11	11	1	10	45	6.2
Calvert	12	8	4	5	10	39	5.4
Somerset	14	1	2	16	2	35	4.9
Kent	13	4	4	5	1	27	3.7
Worchester	4	4	6	0	6	20	2.8
Cecil	10	4	5	0	0	19	2.6
Wicomico	4	4	3	2	3	16	2.2
Anne Arundel	2	1	0	3	3	9	1.2
Montgomery	0	2	4	0	0	6	0.8
Prince Georges	1	1	3	1	0	6	0.8
Carroll	1	0	2	0	2	5	0.7
Howard	0	2	1	0	2	5	0.7
Frederick	0	1	0	0	0	1	0.1
Total	158	147	139	102	175	721	100.0

[1] No data available for 1977.

in a few more incidental otter catches. A larger trap than those commonly used for muskrats is necessary for nutria, and the medium size (220) Conibear has been shown to be capable of catching and holding otter.

Trapping, during the prescribed season, is the only legal method of harvesting otter in Maryland. Other sources of mortality include trapping during the closed season, shooting both in and out of season, road kills and drowning by entanglement in crab pots and fish nets. Limited data indicate that shooting and drowning incidental to fin and shell fishing could represent significant mortality factors. Thirty-two of the 296 carcasses examined (11 percent) showed evidence of gunshot wounds. Five otter (1.7 percent) were judged to have died from such wounds. The diving and swimming capabilities of the otter suggest that wounded animals would not be easily recovered.

Table 2
Verified harvest techniques for river otter carcasses collected in Maryland.

Method	Year			Total	Percent Harvest
	1975	1976	1977		
Conibear	4	20	5	29	30
Leg Hold	4	31	20	55	56
Road Kill	1	1	2	4	4
Found Dead	1	2	1	4	4
Shot	1	1	1	3	3
Crabpot	0	1	0	1	1
Fish Trap	0	1	0	1	1
Box Trap	0	1	0	1	1
Total	11	58	29	98	100

Waterways within and adjacent to otter habitats often sustain extensive and intensive commercial fishing effort. However, these seasons do not coincide with the legal trapping season and possession of the otter killed incidental to those activities is illegal. For that reason, these animals are rarely reported, and the extent of such mortality is not known.

IV. HABITAT

Extensive water is a principal component of otter habitat. Tabor and Wight (1977) in Oregon, and Wilson (1961) in North Carolina reported the greatest otter densities occurred in coastal areas. Maryland harvest records point to the importance of the Chesapeake Bay and its drainages as otter habitat (Fig. 4 and Table 3). In general, marsh, points of land extending into the water, and wooded stream banks are heavily used by otter. Inaccessibility and freedom from human influence appear to contribute to the value of otter habitat in Maryland.

Otter habitat occurs in various wetland types. Types 7 (Wooded Swamp), 12 (Coastal Shallow Fresh Marshes), 13 (Coastal Deep Fresh Marshes), 16 (Coastal Salt Meadows) and 17 (Irregularly Flooded Salt Meadows), as described by Shaw and Fredine (1956), correspond with Maryland otter catch locations. Wooded swamps on Maryland's eastern shore are dominated by loblolly pine (*Pinus taeda*), sweet gum (*Liquid-ambar styraciflua*), greenbrier (*Smilax* spp.) and various grasses (*Gramineae* spp.) and sedges (*Carex* spp.). Fresher marshes (types 12 and 13) on both the eastern and western shores are characterized by cattails (*Typha* spp.), water lily (*Nuphar* spp.), smartweed (*Polygonum aniphibium*), sawgrass (*Cladium jamaicensis*) and bulrushes (*Scirpus* spp.). The more saline types (16 and 17) of marsh feature saltgrass (*Distichlis spicata*), saltmarsh cordgrass (*Spartina alterniflora*), three-square rush (*Scirpus olneyi*) and needlerush (*Juncus roemerianus*) as the domi-

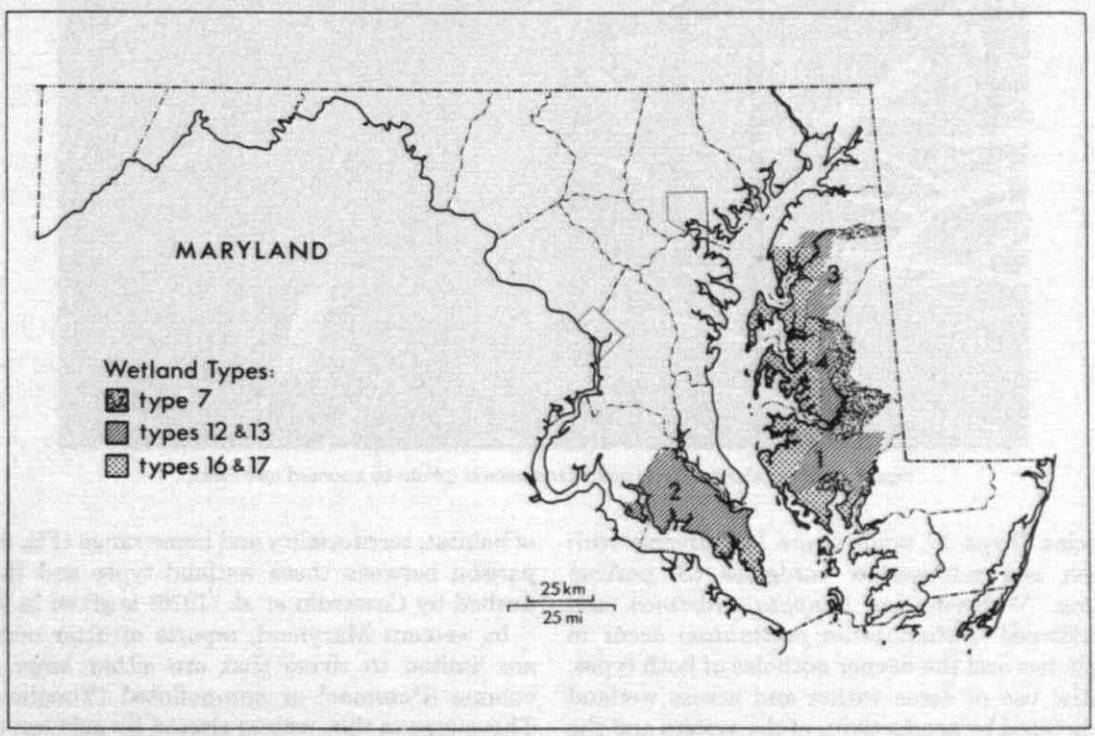

Figure 4. Distribution of wetland types as related to areas of highest otter harvest in Maryland (1973–1975).

Table 3
Correlation between classifications of Shaw and Fredine (1956) and Cowardin et al. (1976) for wetland types that constitute primary otter habitat in Maryland.

	Shaw and Fredine 1956			Cowardin et al. 1976		
	Wetland Type	System	Class/Subclass	Order	Water Regime	Water Chemistry
7.	Wooded Swamps	Palustrine	Forested Wetland	Mineral	Seasonally flooded	Fresh
				Organic	Semipermanently flooded	
		Riverine-Tidal			Irregularly flooded	Fresh
					Regularly flooded	
12.	Coastal Shallow Fresh Marshes	Riverine-Tidal	Emergent Wetland	Mineral	Regularly flooded	Fresh
		Estuarine		Organic	Irregularly flooded	Brackish
13.	Coastal Deep Fresh Marshes	Riverine-Tidal	Emergent Wetland	Mineral	Regularly flooded	Fresh
		Estuarine		Organic	Irregularly flooded	Brackish
16.	Coastal Salt Meadows	Estuarine	Emergent Wetland	Mineral		Brackish
				Organic	Irregularly flooded	Euhaline
17.	Irregularly Flooded Salt Marshes	Estuarine	Emergent Wetland	Mineral	Irregularly flooded	Euhaline
				Organic		Brackish

Figure 5. River otter in typical marshland habitat (photo by Leonard Lee Rue).

nant species. Type 17 tends to be less diverse with needlerush and saltmeadow cordgrass (*S. patens*) dominating. Widgeongrass (*Ruppia martina*) and Sago Pondweed (*Potamogeton pectinatus*) occur in borrow ditches and the deeper potholes of both types. Preferential use of areas within and across wetland types is dictated by productivity of the system and the influence of population phenomena such as diversity of habitat, territoriality and home range (Fig. 5). Comparison between these wetland types and those described by Cowardin et al. (1976) is given in Table 3.

In western Maryland, reports of otter occurrence are limited to rivers that are either large in flow volume (Potomac) or non-polluted (Youghiogheny). This suggests that waters altered by acid mine drainages are uninhabited by otter.

V. DENSITY

The fundamental relationship between habitat and carrying capacity predicts that otter density will be greatest in the primary range (based on harvest) identified in Figure 4. Moreover, if trapping effort is assumed to be concentrated in areas where otter density is high, the relative density of otter in counties is probably reflected in the harvest figures (Table 1). However, absolute density (numbers of animals per unit of habitat) is not known.

The relationship between harvest and actual population size is not known. More detailed and reliable data on otter in Maryland is necessary before population estimates can be made. However, field observations throughout the study verify that the population is reproducing successfully and adapting at least to some degree to man-induced pressures.

VI. REPRODUCTION

Sex Ratio

During each year of the 3-year period 1975–1977, when sample sizes were large enough to allow analysis, more males were trapped than females (Table 4). Only during 1976, however, was this difference statistically significant ($P < 0.05$). It may be inferred that there were either more males than females in Maryland's otter population, or males were more vulnerable to trapping than females.

Parturition Dates

Individual fetuses from different litters were not at the same stage of development and varied considerably in size. Three females caught on February 18, 1976, were pregnant. One female had three fetuses with crown rump measurements of 85-85-90 mm. Another had four fetuses with crown rump measurements of 50-75-70-80 mm. The third female had three fetuses with crown rump measurements of 55-55-57 mm. Because new born otter are about 275 mm in total length (Hamilton and Eadie 1964), we believe none of the 22 litters in utero we examined would have been born prior to March 10 or after May 20. Tabor and Wight (1977) believed parturition began in early April in Oregon, based on size of embryos in four recently implanted litters of females killed in early February.

Based on variable sizes of fetuses collected on the same dates, Maryland otter do not appear to synchronize parturition dates.

Uteri were examined for the presence of placental scars; however, none were found. The trapping season was ending just as the parturition period for otter began; therefore, it is unlikely that carcasses of females would be obtained with fresh placental scars. Mustelids do not exhibit obvious placental scars (Wright 1963, Hamilton and Cook 1955), and reproductive history based on placental scars may not be accurate for the river otter. Tabor and Wight (1977:694) found no placental scars in otter collected in Oregon.

A juvenile otter which had apparently been killed by a fox was obtained on June 1, 1975. The otter had its eyes open and was about seven weeks old (Liers 1951:7). Assuming our estimated age is correct, this otter would have been born about April 26, 1975.

Corpora Lutea Per Female

There was no significant difference in the mean number of corpora lutea per female among years or age groups (Tables 5 and 6). The mean number of active corpora lutea for otter in Maryland was 2.74 ± 0.77, while in Oregon, Tabor and Wight (1977:696) reported a mean of 3.02 ± 0.07.

A total of 16 females had regressing corpora lutea (Table 5) indicating that they had previously been pregnant. Of these 16, four (25 percent) also had active corpora lutea. It is possible that some adult female otter in Maryland do not breed every year. However, Tabor and Wight (1977:696) believed that female otter in Oregon bred annually.

It is interesting to note, that of 15 litters with implanted embryos, four (26 percent) showed ova crossing to the opposite uterine horn.

Litter Size

Twenty-two of the 31 pregnant females we examined had implanted embryos (Table 5). The mean litter size for Maryland otter was 2.73 ± 0.77. In Oregon, the

Table 4
Sex ratios of trapped otter from Maryland 1974-1977.

Year	Males	Females	Males Per 100 Females	Significance Level
1974	0	3	—	—
1975	31	29	106	> 0.05
1976	57	37	154	< 0.05
1977	74	53	139	> 0.05
Total	162	122	132	< 0.05

Table 5
Number of regressing corpora lutea, active corpora lutea, and implanted embryos per female from Maryland otter.

	Regressing Corpora Lutea			Active Corpora Lutea			Implanted Embryos		
Year	No. Females	Mean ± SD	Range	No. Females	Mean ± SD	Range	No. Females	Mean ± SD	Range
1975	6	1.33 ± 0.52	1–2	10	2.60 ± 0.84	1–3	5	2.60 ± 0.89	1–3
1976	5	1.60 ± 1.03	1–3	6	2.50 ± 1.04	1–4	4	3.00 ± 0.71	2–4
1977	5	2.00 ± 1.00	1–3	15	2.93 ± 0.59	1–4	13	2.69 ± 0.63	1–4
Total	16	1.62 ± 0.78	1–3	31	2.74 ± 0.77	1–4	22	2.73 ± 0.77	1–4

Table 6
Age, ovulation rate and litter size for female river otter collected in Maryland (1974-1977).

Age Class	Number Females	Pregnant Females	Percent Pregnant	Mean Litter Size	Sample Size	Mean Ovulation Rate	Sample Size
< 1	23	0	0	—	—	—	—
1	14	1	7.1	—	—	3.0	1
2	17	11	64.7	2.4	8	2.4	10
3	11	5	45.4	3.0	2	2.75	4
4	6	4	66.6	4.0	1	3.25	4
5	2	2	100.	2.5	2	3.0	1
6	2	2	100.	1.0	1	2.0	1
7	0	0	—	—	—	—	—
8	1	1	100.	3.0	1	3.0	1
9	0	0	—	—	—	—	—
10	1	1	100.	1.0	1	—	—

mean litter size based on four sets of implanted embryos was 2.75 (Tabor and Wight 1977:696) essentially the same as reported here for Maryland.

Intra-uterine Mortality

Based on the 44 corpora lutea from 15 otter whose uteri contained 40 implanted embryos, 9 percent (4) of the ova either failed to implant or were resorbed before becoming visible as embryos. In addition, two of the 40 embryos (5 percent) were being resorbed. One litter was found to be completely resorbed and the ovaries contained three corpora lutea. Thus, in addition to the one fetus being resorbed, two either failed to implant or had already been completely resorbed. Tabor and Wight (1977:696) believed that intrauterine mortality was low in Oregon river otter.

VII. POPULATION STATUS

The population status of Maryland otter was estimated using the structural model developed by Henny et al. (1970). The following formula was used to estimate the population status:

$$1 = \frac{s_0\, s^2\, m}{(1+\mu)^2\,(1+\mu-s)}$$

where s = average annual survival rate of females in age classes 1–10, s_x = age specific female survival rate, m = average annual recruitment rate of female pups per adult female and μ = annual rate of change in population size.

Survival rates were determined for female otter from Table 7 using time specific life table procedures (Tabor and Wight 1977:694). Age specific survival rates were determined by the formula:

$$\bar{s}_x = \frac{l_{x+1}}{l_x}$$

where $\bar{s}_x$ = age specific annual survival rate, l_x = number of otter of age class x in the sample, and l_{x+1} = number of otter of age x + 1 in the sample (Fig. 6, Table 7).

The average annual recruitment rate of female pups per adult female was calculated from Table 7 by dividing the number of female pups in age class 0 by the number of adult females (age class 3–10) in the harvested population (Tabor and Wight 1977). An average annual recruitment rate of 1.0 was determined from the sample of Maryland otter.

The parameter μ for the population was estimated through trial and error until the equation was balanced. In addition, survival estimates were adjusted for each introduced value of μ in order to account for an increasing or decreasing population. Modified survival estimates (Tabor and Wight 1977:698) were calculated by the formulas:

(1) $$s_x' = \bar{s}_x\,(1-\bar{\mu})$$

(2) $$s' = \bar{s}\,(1-\bar{\mu})$$

where s_x' = adjusted, age specific annual female survival rate used in the population model, s' = adjusted, average annual female survival rate for age class 1–10 used in the population model, $\bar{s}_x$ = age specific, annual female survival rate as calculated by life table procedure, $\bar{s}$ = average annual survival rate of females in

Table 7
Age classes and survival rates of female river otter collected in Maryland (1974-1977).

Age Class	Number Females	Adjusted Frequency	$\bar{S}x$
< 1	23	20.48	.83
1	14	17.01	.69
2	17	11.74	.69
3	11	8.10	.69
4	6	5.59	.69
5	2	3.85	.69
6	2	2.66	.69
7	0	1.83	.69
8	1	1.26	.69
9	0	.87	.69
10	1	.60	0

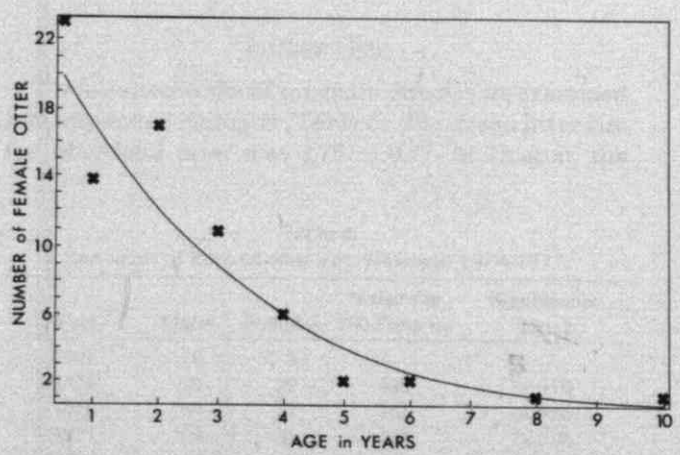

Figure 6. Survival curve for female river otter collected in Maryland (1974–1977).

age classes 1–10 as calculated in life table procedure, and $\bar{\mu}$ = introduced value for annual rate of change in population size.

By substituting various values of μ and the adjusted survival rates modified by μ (s_0', s_1' and s'), a value of .027 was determined, indicating an annual population increase of 2.7 percent.

The only other comparable data for river otter populations was from Oregon (Tabor and Wight 1977: 698). During their study, they found that the Oregon river otter population was essentially stable (μ = −0.004). The equation used for the calculation of otter productivity in Maryland assumes female otter reach reproductive age in their third year. Because of this, any yearling female otter breeding would raise the productivity estimate. Thus, if yearling females do occasionally breed in the Maryland population, the productivity estimates would be slightly higher. However, we do not feel that on the basis of our one observation this assumption can be made. We feel that our data reflects a stable population for Maryland otter. As long as the habitat is suitable, and the harvest remains at present levels, the Maryland otter population should remain stable.

VIII. DISCUSSION AND MANAGEMENT IMPLICATIONS

Although specific otter population densities were not determined, the data show a stable, if not slightly increasing, otter population in Maryland.

The pelt tag data during the last decade reflect a mean annual otter harvest of approximately two hundred animals. Annual harvests varied considerably—the lowest recorded harvest was 131, and the highest was 360 otter.

We predict that Maryland's otter population will remain stable under present harvest regulations if habitat conditions do not change significantly. The present regulations should not promote annual harvests in excess of 360 animals. If annual otter harvests exceed 360 animals for two successive years, their population status should be re-evaluated.

The distribution of the harvest, habitat conditions and changes will be monitored and recorded annually.

IX. SUMMARY

1. The River otter (*Lutra canadensis*) population in Maryland was studied between 1974 and 1977. Additional data on harvest were collected through 1978.

2. The primary harvest areas for river otter were the counties surrounding Chesapeake Bay. A few otter were trapped along the Potomac River. The annual harvest fluctuated from year to year. Extensive water areas were the principal component of otter habitat.

3. The sex ratio of trapped river otter in Maryland favored males.

4. Based on variable sizes of fetuses collected on the same dates, Maryland otter did not appear to synchronize parturition dates. However, it is believed that parturition occurs between March 10 and May 20 in Maryland.

5. The ovaries of pregnant female river otter in Maryland contained a mean of 2.74 ± 0.77 active corpora lutea. Of 15 litters examined, four (26 percent) showed evidence of ova crossing to the opposite uterine horn.

6. The mean litter size for Maryland otter was 2.73 ± 0.77. Based on 44 corpora lutea from 15 otter whose uteri contained 40 implanted embryos, 9 percent (4) of the ova either failed to implant or were resorbed before becoming visible as embryos.

7. The population status of Maryland otter was estimated using the structural model developed by Henny et al. (1970). An annual population increase of 2.7 percent indicated that the Maryland otter population is essentially stable; and that as long as the habitat is suitable, the Maryland otter population will remain at present levels.

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